

BUREAU OF WATER

South Carolina Department of Health and Environmental Control

SHELLFISH MANAGEMENT AREA 10A

2006 ANNUAL UPDATE

Shellfish Sanitation Program

Water Monitoring, Assessment and Protection Division

Environmental Quality Control - Bureau of Water

2600 Bull Street

Columbia, South Carolina 29201

July 2006



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2006 ANNUAL UPDATE

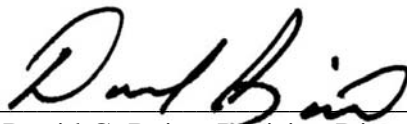
[Data Thru December 2005]

Shellfish Management Area 10A Shellfish Sanitation Program



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ANNUAL UPDATE
Shellfish Management Area 10A
SCDHEC EQC Bureau of Water

Data Inclusive Dates:

01 / 01 / 03 thru 12 / 31 / 05

Classification Change:

 X Yes No

Shoreline Survey Completed: Yes

(I)ncreased/(D)ecreased/(N)one:

 I Approved

 N Conditionally Approved

 D Restricted

 N Prohibited

Prior Report & Date: Annual - 2005

SUMMARY

Shellfish growing area water quality within portions of Shellfish Management Area 10A (Area 10A) continues to fluctuate between Approved and Restricted growing area criteria. For the January 2003 through December 2005 review period, 17 of the 28 classified stations exhibit a slight decrease in fecal coliform geometric means and/or estimated ninetieth percentile most probable number (MPN) values from those of the previous three-year review period. Water quality at 24 of 28 stations, however, meets statistical criteria for an Approved classification. A large portion of the Area 10A upland shoreline has residential development bordering the marsh. Impervious surfaces typically result in increased volumes of stormwater runoff and a more rapid movement of stormwater into adjacent shellfish harvesting waters. Increases in rainfall typically result in increased stormwater runoff, which often results in elevated fecal coliform levels. These factors increase the potential for water quality to be adversely impacted within the immediate area. Emphasis has been placed on surveying the land and homes around Clark Sound and the Secessionville area due to the use of individual waste treatment systems for waste disposal.

Water quality in the Clark Sound area represented by Station 10A-15 continues to exceed criteria for an Approved classification. The area between stations 10A-33, 10A-34, 10A-13, and 10A-15A will retain a Restricted classification.

Water quality at Station 16A continues to exceed criteria for an Approved classification. The area upstream of Station 10A-16A, extending to stations 10A-16, 10A-33, and 10A-34, will retain a Restricted classification

Eastern portions of Clark Sound, between stations 10A-16 and 10A-35, will be reclassified as Approved. Coordinates for station 10A-16 will be updated to accurately reflect the location that is actually being sampled.

Station 10A-28 will be deactivated. Adjacent Lighthouse Creek stations 10A-23 and 10A-26 exhibit consistently Approved water quality, therefore continued sampling of 10A-28 is

deemed unnecessary, as sampling resources could be better utilized elsewhere.

INTRODUCTION

PURPOSE AND SCOPE

The authority to regulate the harvest, sanitation, processing and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47, which provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The United States Food and Drug Administration (USFDA) uses The National Shellfish Sanitation Program's (NSSP) *Guide for the Control of Molluscan Shellfish* to evaluate state shellfish sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each growing area prior to its use as a source of shellfish for human consumption and prior to the area's classification as Approved, Conditionally Approved, Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirement of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and South Carolina Regulation 61-47 are used in establishing shellfish harvesting classifications:

Approved - Growing areas shall be classified Approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations which would render shellfish unsafe for human consumption. The Approved area classification shall be designated based upon a sanitary survey, which includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform MPN or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, and not more than ten percent of the samples shall exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform MPN shall not exceed fourteen per one hundred milliliters, and the estimated ninetieth percentile shall not exceed an MPN of forty three (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Conditionally Approved - Growing areas may be classified Conditionally Approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as Conditionally Approved. Where appropriate, the management plan for each Conditionally Approved area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems, evaluation of each source of pollution, and means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate.

Restricted - Growing areas shall be classified Restricted when sanitary survey data show a limited degree of pollution or the presence of deleterious or poisonous substances to a degree which may cause the water quality to fluctuate unpredictably or at such a frequency that a Conditionally Approved classification is not feasible. Shellfish may be harvested from areas classified as Restricted only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. For Restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Conditionally Restricted - Growing areas may be classified Conditionally Restricted when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as Conditionally Restricted. Where appropriate, the management plan for each Conditionally Restricted area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems and an evaluation of each source of pollution) and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as Conditionally Restricted only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision. For Conditionally Restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of Conditionally Restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a

systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Prohibited - Growing areas are classified Prohibited if there is no current sanitary survey or if the sanitary survey or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or indicate that such substances could potentially reach quantities which could render shellfish unfit or unsafe for human consumption.

BACKGROUND INFORMATION

This sanitary survey evaluates the current harvesting classification of shellfish growing waters designated as Shellfish Management Area 10A. Area 10A consists of approximately 15,191 acres of shellfish growing area habitat located in Charleston County, South Carolina. Area 10A extends in a northeasterly to southwesterly direction from the Charleston Harbor to the Stono River. The major water bodies in Area 10A include Folly River, Lighthouse Creek, Schooner Creek and Clark Sound. The area is bordered to the northeast by the geographic boundaries of Clark Sound and Parrot Point Creek. An imaginary line from the confluence of the Folly River and the Stono River, northeastward through King Flats, to a point adjacent to Fludd's Creek, at the northwest corner of Clark Sound, defines the area's western boundary. The southern and eastern boundaries consist of the Atlantic Ocean shoreline of Folly and Morris Islands respectively.

The harvesting classifications of Area 10A prior to this sanitary survey were as follows:

Prohibited: (Administrative Closure)

1. Those waters and adjacent marshland between Schooner Creek and the Charleston Harbor;
2. Those waters within 1,000 feet of Backman's Commercial Fisheries Dock and Folly Marina;
3. Those waters within 1,210 feet of Mariner's Cay Marina;
4. Those waters within 350 feet of Crosby's Commercial Fisheries Dock.

Restricted:

1. Those waters of Clark Sound and adjacent marshlands in its entirety;
2. Those waters of Secessionville Creek and adjacent marshlands extending from Station 10A-15A north to Clark Sound;
3. The north bank of Folly Creek and all adjacent marshland extending from Station 10A-15A Northeast to Station 10A-13;
4. The west bank of Lighthouse Creek and all adjacent marshland extending from Station 10A-13 north to station 10A-33;
5. The north bank of Schooner Creek and all adjacent marshland extending from

- Station 10A-33 Northeast to an imaginary line extending due south from Station 10A-35;
6. Those waters of Block Island Creek and adjacent marshland extending from Station 10A-32 to its headwaters at the southern end of Morris Island.

Approved: All other waters in Area 10A.

The shellfish industry in South Carolina is based primarily on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams, which include both the northern clam (*Mercenaria mercenaria*) and several small populations of the southern clam (*Mercenaria campechiensis*). Areas in South Carolina designated for commercial harvest by the South Carolina Department of Natural Resources (SCDNR) include State shellfish grounds, Culture permits, and Kings Grant areas. The ribbed mussel (*Geukensia demissa*) is also harvested in South Carolina. *Geukensia sp.* harvest is an extremely small-scale recreational fishery. The South Carolina Department of Health and Environmental Control disallows the harvesting of shellfish for direct marketing purposes from restricted waters. Shellfish harvesting from Prohibited waters for human consumption is not allowed.

There are eight State Shellfish Grounds (S) within Area 10A: S-203, S-205, S-206 East, S-206 West, S-196, S-201, S-200, and S-189. There is one Recreational Shellfish Ground (R) located in Area 10A, R-201. Numerous shellfish culture (C) and mariculture (M) permit leases are located throughout Area 10A.

The shellfish harvest season in South Carolina normally extends from mid-September through mid-May. The SCDNR has the authority to alter the shellfish-harvesting season for resource management purposes and grant permits for year-round mariculture operations. Additionally, the South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that shellfish harvested in South Carolina waters are safe for human consumption.

POLLUTION SOURCE SURVEY

CHANGES IN POLLUTION SOURCES

No substantial changes in pollution sources have occurred in Area 10A since the 2005 report.

SURVEY PROCEDURES

Shoreline surveys of Area 10A were conducted by the Region 7 Shellfish Sanitation staff, by watercraft, vehicle and on foot, during the survey period and are ongoing. Extensive visual examinations of lands adjacent to the waters of Area 10A were conducted to determine potential sources of pollution entering shellfish growing waters.

THERMAL IMAGING

The Department recently funded a pilot project to determine the effectiveness of Forward Looking Infrared Radar (FLIR) in locating sources of pollution in close proximity to coastal shellfish harvest areas. FLIR is a type of thermal infrared imaging that can help locate contaminated “seeps” by detecting differences in water temperature, thereby providing coastal managers with smaller focus areas from which to obtain water samples and conduct shoreline survey investigations.

Regional Shellfish Program personnel prioritized study areas based upon shellfish area closures due to elevated fecal coliform levels - potentially from failing septic systems. Nighttime surveillance flights were conducted during February 2005, when relatively warm discharges from potential pollution sources such as leaking septic systems would contrast in comparison with colder river/creek surface waters. Flying during the winter also minimized interference from vegetation.

Based on thermal imagery data obtained through aerial surveillance, Region 7 Shellfish Program staff investigated potential pollution sources and, when appropriate, conducted bacteriological water quality analysis during the spring and summer of 2005. Sample locations and results of site investigations are provided in appropriate sections of this report.

POINT SOURCE POLLUTION

- A. Municipal and Community Waste Treatment Facilities** - There are no permitted wastewater facilities within Area 10A. Nearly all of Area 10A is served by the James Island Public Service District. The Plum Island Wastewater Treatment Plant (SC0021229), operated by the Charleston Commissioners of Public Works, receives wastewater from James Island; however, Plum Island is located on the Ashley River adjacent to Wappoo Creek, and discharges treated wastewater into the Charleston Harbor (Area 10B).

Available hydrographic information suggests a possible impact from sources located outside the growing area. The portion of the area from the Charleston Harbor extending southwest to Schooner Creek appears to be adversely impacted during certain hydrographic conditions by waters originating in the Charleston Harbor (Moore, 1984). Outfalls from wastewater treatment plants discharging into the harbor are subsequently discharging into northeastern portions of Area 10A. Flow calculations have established time and distance of travel and place the effluent plumes within Schooner Bay near Fort Sumter. Due to public health concerns, waters from the confluence of Schooner Creek and Schooner Bay and all associated creeks and marshland to the Charleston Harbor will remain administratively Prohibited.

- B. Industrial Waste (Discharges)** - Atlantic Farms, Inc. is the only permitted industrial discharge within Area 10A. Atlantic has been issued a NPDES general permit SCG130001 for aquaculture discharges. General permit SCG130001 discharges to Folly

Creek, which is adjacent to the facility. This discharge is depicted on the attached Potential Pollution Source Map.

- C. Marinas** - South Carolina Regulation 61-47, Shellfish defines *Marina* as “any water area with a structure (docks, basin, floating docks, etc.), which is: 1) used for docking or otherwise mooring vessels; and, 2) constructed to provide temporary or permanent docking space for more than ten boats, or has more than 200 linear feet of docking space.” There are two recreational marinas located within this management area. Mariner's Cay Marina is located on the Folly River adjacent to Folly Road and offers wastewater pump-out to marina occupants. Folly Marina is located on the Folly River approximately one mile southwest of Mariner's Cay. The owner demolished the existing marina and is currently building condominiums on the site. The docks are also being replaced. However, at this time it is unclear whether they will continue to offer services to live-aboards or will only provide services to condominium residents. It is recommended in this survey to maintain the current closure zone until such time as construction is completed. Additionally, two commercial facilities meeting the definition of a marina are located within Area 10A. Backman's Seafood operates a dock located in a Backman's creek, north of Bowen's Island. Crosby's Fish and Shrimp Company operates a dock located in Folly Creek adjacent to Folly Road. All marinas within Area 10A currently have adequate closure zones.
- D. Radionuclides** - Sources of radionuclides have not been identified within Area 10A, and radionuclide monitoring has not been conducted. No other sources of poisonous or deleterious substances have been identified within the area.

NONPOINT SOURCE POLLUTION

- A. Urban and Suburban Stormwater Runoff** - The shoreline survey conducted in Area 10A revealed numerous homes upland adjacent to shellfish growing areas. Single-family homes continue to be built sporadically along the mainland shores. Heavy development continues to occur around Folly Creek and Oak Island areas within Area 10A. Run-off from these locations has the potential to affect shellfish growing areas in the Folly River.

The Army Corps of Engineers conducted dredging projects in Area 10A during this survey period. The Folly River entrance requires maintenance dredging on a regular basis. Dredging of this channel was conducted this year. The dredge material is usually either placed on the ocean side of the southern most portion of Folly Island for beach renourishment or placed in an offshore spoil site. During this year's operation, dredge material was moved to just outside the channel by means of a boom on the dredge vessel.

Morris Island is the only dredge spoil area within Area 10A. The Army Corps of Engineers reserves the right to use the spoil area at any time. The State Ports Authority (SPA) conducts maintenance dredging adjacent to their terminals (Area 10B). The Drum Island spoil area is the primary site used by the SPA in the Cooper River. The site is reaching its capacity and will soon be permanently closed. The SPA may then use

Morris Island more frequently.

Dredging of Shem Creek in Area 10B was conducted during the 2005 review period. Morris Island was the spoil area used for this project. Stations 10A-29 and 10A-32 in Block Island Creek will continue to be monitored for any change in water quality possibly related to pollutants coming from the spoil area.

The uplands surrounding the shellfish growing waters of Area 10A consist of various soil textures defined by the United States Department of Agriculture (USDA), Soil Conservation Service (1971) utilizing general classifications and descriptions. Although lands within Area 10A consist of numerous soil types, the area is generally comprised of Wando-Seabrook soils and occur on flat ridges and lower lying bands. The USDA (1971) further describes these soils as "moderately well drained to excessively drained, nearly level to gently sloping, sandy soils."

- B. Agricultural Runoff** - There are no permitted agricultural facilities located in Area 10A. The lack of concentrated agricultural activity near the shoreline of the growing waters minimizes the potential for contamination of shellfish waters from agricultural runoff.
- C. Individual Sewage Treatment and Disposal Systems** - Homes adjacent to shellfish growing waters on James Island and Folly Island are primarily served by sanitary sewer, although some homes in the outlying areas, primarily on the northern end of Folly Island, are serviced by individual septic systems. Each system requires inspection by the Division of Environmental Health, Trident Health District, and approval before final installation.

Sample Data for Area 10A Aerial Flight .

Sample	Longitude	Latitude	Sample Date	Sample Results
SW-10-1	32.730846	79.922202	April 21, 2005	17,000
This sample was taken at a dock off of Fort Johnson Road. This area is currently being inspected for a potential source.				
SW-12	32.735825	79.909493	April 19, 2005	8,000
This sample location was re-sampled on April 21, 2005 with a result of 13. This sample will be watched in case the source of the first sample can be identified.				
SW-17	32.658577	79.947317	May 19, 2005	22,000
This sample location was re-sampled on April 20, 2005 with a result of 2. This sample will be watched in case the source of the first sample can be identified.				
SW-19	32.658834	79.944233	April 20, 2005	22,000
This sample was taken in a storm water ditch that runs behind a construction business located on the west side of Center Street on Folly Beach. The ditch is along this area is currently being inspected for a potential source.				
SW-22A	32.658770	79.942153	April 20, 2005	>160,000
This location is on East Indian on Folly Beach. This sample location was turned over to the Region 7 septic inspectors for DHEC. The cause for the high counts has not been identified. Inspectors are still working on identifying the actual source.				
SW-24	32.661624	79.937666	April 20, 2005	>160,000
This location is on East Huron on Folly Beach. This sample location was turned over to the Region 7 septic inspectors for DHEC. The cause for the high counts was identified as a failing septic system and an open washing machine discharge line. Inspectors are still working with the owners to rectify the situation.				
SW-25	32.662053	79.936621	April 20, 2005	11,000
This location is on the marsh side of Folly Beach at the end of E. 4 th Street. The area is a low depression susceptible to flooding and the collection and retention of rainwater. This area is currently being inspected for a potential source; however, the most likely candidate is wildlife using this area as a watering hole.				
SW-32	32.669091	79.912971	April 21, 2005	3,000
This sample station is located on the east side of 13 th Street. This area is a holding area for storm water runoff. This area is currently being inspected for a potential source.				

- D. Wildlife and Domestic Animals** - Area 10A supports a large population of domestic animals attributable to numerous private residences along the shores of both James Island and Folly Island. The area supports a moderate amount of wildlife, primarily various types of waterfowl and marine mammals. These marine birds and mammals have been seen in large concentrations along Bird Key in the Folly River. The entire growing area has an extensive network of small tidal creeks. This creek system provides a possible conduit for animal fecal coliform bacteria to be transported to adjacent growing waters.
- E. Boat Traffic** - Recreational boat traffic is moderate in the area throughout the year. Commercial fisheries boats, ranging in size from 16 to 50 feet, operate throughout the area. There are heavy mariculture interests within this area. Folly River and Folly Creek are used on nearly a daily basis by these permit holders. During the recreational shrimp-baiting season, typically extending from mid-September through mid-November, recreational traffic is heavy.
- F. Hydrographic and Habitat Modification** - Hydrographic and habitat modification in estuarine areas requires both State and Federal approval. Portions of Folly River require maintenance dredging. The United States Army Corps of Engineers utilize a designated tract of land adjacent to Lighthouse Creek on Morris Island as a dredge spoil site.
- G. Marine Biotoxins** - Bivalve shellfish contamination from marine biotoxins has not been shown to be a human health concern within Area 10A. The Shellfish Sanitation Section has developed a Biotoxin Contingency Plan in response to a *Gymnodinium breve* (formally *P. brevis*) bloom that occurred during the 1997-1998 shellfish harvest season. The Department also participates in an interagency Toxic Algae Workgroup and directs a Toxic Algae Emergency Response Team.

HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

PHYSIOGRAPHY

Area 10A consists of the waters of the Folly River system and the Clark Sound basin. Connections with the Atlantic Ocean are via Charleston Harbor, Lighthouse Inlet and Stono Inlet. Influence of high salinity ocean water entering the area by way of these inlets provide high flow and a subsequent flushing action which assists in maintaining high water quality. The creeks within the area range from 30 to 500 feet in width and average 3 to 25 feet in depth. The entire area is approximately four miles wide (northwest to southeast) and eleven miles long (southwest to northeast).

Tides - Tides in Area 10A are semidiurnal, consisting of two low and two high tides occurring each lunar day. Mean tidal ranges in Folly Creek, at the Folly Road Bridge, are 5.5 feet during normal tides and 7.1 feet during spring tides. Wind direction and intensity, as well as atmospheric pressure, typically cause variations in predicted tidal ranges.

Rainfall - Precipitation in Area 10A is heaviest during late summer and early autumn.

Tropical storms and hurricanes occasionally produce extremely large amounts of rainfall. During winter months heavy rainfall events are uncommon, yet occasional intense thunderstorms associated with rapidly moving low-pressure systems generate heavy rains. Precipitation rarely occurs in the form of snow or ice. Spring weather patterns may be dynamic with associated thunderstorms and severe weather conditions.

The yearly rainfall average for a thirty-year period in Charleston, recorded at the Charleston Airport, is 50.5 inches. The 2005 precipitation total recorded at Plum Island on James Island was 64.05 inches.

Winds - Prevailing winds along the central portion of the South Carolina coast are from the south and west during spring and summer and from the north during autumn and winter. Wind speeds are generally less than 15 miles per hour (mph); however, strong weather systems may generate winds in excess of 25 mph. Tropical storms and hurricanes occur occasionally.

River Discharges - Freshwater rivers do not discharge directly into Area 10A. Freshwater influence is primarily due to rainfall.

WATER QUALITY STUDIES

DESCRIPTION OF THE PROGRAM

The Department currently utilizes a systematic random sampling (SRS) strategy within Area 10A in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty samples are required to be collected and analyzed from each station during the review period. Sampling dates are computer generated prior to the beginning of each quarterly period thereby insuring random selection with respect to tidal stage and weather. Day of week selection criteria is limited to Mondays, Tuesdays and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered.

During July 1998, an updated shellfish water quality data scheduling and collection procedure was formalized. Samples utilized for classification purposes are limited to those samples collected in accordance with the SRS for a 36-month period beginning January 1 and ending December 31. This allows for a maximum of 36 samples per station, yet provides a six-sample “cushion” (above the NSSP required 30 minimum) for broken sample bottles, lab error, breakdowns, etc. This also allows each annual report’s water quality data to meet the requirements for the NSSP Triennial Review sampling criteria.

Nine hundred eighty-four (984) SRS surface water quality samples (<1.0 ft deep) were collected for bacteriological analyses and classification purposes from twenty-eight active water quality sampling stations in Area 10A during the period 01/01/03 through 12/31/05. Forty-seven (47) special samples for non-classification purposes were also collected. Twenty-three (23) were associated with two precautionary rainfall closure events in October and December 2005. The remaining twenty-four (24) were associated with a rainfall closure event in September 2003.

Samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported to the South Carolina Department of Health and Environmental Control's Region 7 Environmental Quality Control Laboratory at North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment as a temperature control. At the laboratory, sample sets exceeding a 30-hour holding time or containing a temperature control in excess of 10 degrees C. were discarded (APHA, 1970).

Surface water temperatures are measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements are obtained in the laboratory using an automatic temperature compensated refractometer. Additional field data include ambient air temperature, wind direction, tidal stage and date and time of sampling. Tidal stages are determined by using Nautical Software's *Tides & Currents*, Version 2 (1996).

MONITORING RESULTS

Station 10-16A exceeds a fecal coliform geometric mean MPN value of 14. No station exceeds a fecal coliform geometric mean MPN value of 88. Stations exceeding fecal coliform MPN estimated ninetieth percentile values of 43 are 10A-15, 10A-16A, and 10A-34. No station exceeds an estimated ninetieth percentile fecal coliform MPN value of 260. Station 10A-29 is new and lacks the requisite minimum samples for classification purposes.

Routine samples taken on 9/08/2004 were taken while the entirety of Area 10A was closed as a precaution due to a sewage spill that occurred nearby in Charleston Harbor. The spill does not appear to have affected water quality at any of the sampling stations.

CONCLUSIONS

Based on a review of the fecal coliform bacteriological data and the pollution source survey, Area 10A is primarily impacted by two sources of actual or potential pollution.

POTENTIAL POINT SOURCE IMPACTS

Portions of Area 10A between Station 10A-18 and Charleston Harbor are administratively Prohibited due to potential concerns of industrial impacts from the harbor entering Area 10A, not water quality based on fecal coliform bacteria levels.

NONPOINT SOURCE RUNOFF

The majority of stations within Area 10A meet the statistical criteria for an approved classification. Stormwater runoff continues to be the major source of minimal fecal coliform contamination throughout the area. The moderate populations of domestic and wild animals likely impact water quality in the area. Overland runoff in Area 10A appears to be mitigated by ocean water flushing through Lighthouse and Stono Inlets.

RECOMMENDATIONS

Shellfish growing area water quality within portions of Area 10A continues to fluctuate between Approved and Restricted area criteria. For the January 2002 through December 2004 review period, 17 of the 28 classified stations exhibit a slight decrease in fecal coliform geometric means and/or estimated ninetieth percentile most probable number (MPN) values from those of the previous three-year review period. Water quality at 24 of 28 stations meet statistical criteria for an Approved classification. Nearly all of Area 10A upland shoreline has residential development bordering the marsh. Impervious surfaces typically result in increased volumes of stormwater runoff and a more rapid movement of stormwater into adjacent shellfish harvesting waters. Increases in rainfall typically result in increased stormwater runoff, which often results in elevated fecal coliform levels. These factors increase the potential for water quality to be adversely impacted within the immediate area. Emphasis has been placed on surveying the land and homes around Clark Sound due to the use of septic systems for waste disposal.

One classification change is recommended for Area 10A. The eastern portion of Clark Sound, between stations 10A-16 and 10A-35 is recommended for reclassification as Approved.

The following shellfish harvesting classification of Area 10A is recommended:

Prohibited: (Administrative Closure)

1. Those waters and adjacent marshland between Schooner Creek and the Charleston Harbor;
2. Those waters within 1,000 feet of Backman's Commercial Fisheries Dock
3. Those waters within 1,000 feet of Folly Marina;
4. Those waters within 1,210 feet of Mariner's Cay Marina;
5. Those waters within 350 feet of Crosby's Commercial Fisheries Dock.

Restricted:

1. Those waters of Clark Sound and adjacent marshlands west of Station 10A-16;
2. Those waters of Secessionville Creek and adjacent marshlands extending from Station 10A-15A north to Clark Sound;
3. The north bank of Folly Creek and all adjacent marshland extending from Station 10A-15A Northeast to Station 10A-13;
4. The west bank of Lighthouse Creek and all adjacent marshland extending from Station 10A-13 north to station 10A-33;
5. Those waters of Block Island Creek and adjacent marshland extending from Station 10A-32 to its headwaters at the southern end of Morris Island.

Approved: All remaining waters of Area 10A.

Station Additions/Deactivations/Modifications:

Deactivation: Station 10A-28 is recommended for deactivation. Station 10A-23 to the north and Station 10A-26 to the south in Lighthouse Creek exhibit consistently Approved water quality, therefore continued sampling of 10A-28 is deemed unnecessary, as sampling resources could be better utilized elsewhere.

Modification: Station 10A-16 should be modified to reflect the actual sampling coordinates of 32.717505, -79.928255. The current map coordinates show the station location in emergent vegetation.

Analysis of sampling data for Area 10A demonstrates the probability of a significant impact from rainfall exceeding 4.00" in a 24-hour period. Therefore, a precautionary closure of Area 10A will be implemented following rainfall events of greater than 4.00" in a 24-hour period, as measured at the Charleston Commissioners of Public Works, Plum Island Wastewater Treatment Plant located on James Island. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP). PMP estimates for the coastal United States have been published in a series of hydro-meteorological reports (HMRs) by the National Weather Service (*National Weather Service*). PMP estimates for South Carolina's growing areas are derived from HMRs 51, 52, and 53 (*National Research Council, 1985*).

REFERENCES

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- National Research Council, 1985, "*Safety of Dams - Flood and Earthquake Criteria*," National Academy Press, Washington DC.
- National Shellfish Sanitation Program (NSSP) -- *Guide for the Control of Molluscan Shellfish*, 1997 Revision, U.S. Department of Health and Human Services, Washington, D.C.
- National Weather Service, The National Oceanic and Atmospheric Administration, *Precipitation Frequency Atlas of the Western US: NOAA Atlas II* - Superintendent of Documents, US Government Printing Office, Washington DC.
- United States Department of Agriculture, Soil Conservation Service, 1971, *Soil Survey of Charleston County, South Carolina*. In cooperation with South Carolina Agricultural Experiment Station and South Carolina Land Resources Conservation Commission, National Cooperative Soil Survey, Washington, D.C. p. 78.
- Moore, E., 1984. *Clark Sound: Water Quality Assessment of a Shellfish Growing Area*, South Carolina Department of Health and Environmental Control, Shellfish and Recreational Waters Division.

TABLE #1
Shellfish Management Area 10A
Water Quality Sampling Stations Description

<u>Station</u>	<u>Description</u>
02	Folly Creek at Hwy. 171 Bridge
03	Bowen's Island Dock in Folly Creek
04	Backman Creek at Folly Creek
05	King Flats Creek
06	Opposite Little Island in Folly Creek
07	North boundary of Prohibited Area at Folly Marina
08	Folly River at Hwy. 171 Bridge
09	Last dock north in Folly River
10A	Robbins Creek at the first bend upstream from Cutoff Reach (New for 2006)
11	Rat Island Creek at confluence with first creek on left from Lighthouse Creek
13	Lighthouse Creek at confluence with Folly Creek
15	Secessionville Creek at private docks
15A	Folly Creek at confluence with Secessionville Creek
16	Clark Sound at Ocean View Flats
16A	Fludd's Creek at Clark Sound
18	Mouth of Schooner Creek
19	Just inside Clark Sound from Schooner Creek
22	Folly River State Shellfish Ground opposite Folly Island
23	Lighthouse Creek at confluence with First Sister Creek
24	Second Bend in Cole Creek
26	Lighthouse Creek just seaward of confluence with Folly River
28	Mouth of small creek leading to back of Block Island (Deactivate 1/1/07)
29	Outfall of Morris Island discharge
30	Second bend in Rat Island Creek
31	Upper reaches of Rat Island Creek at fork NW of Station 11
32	Block Island Creek - 100 yards south of split from spoil area
33	Confluence of Lighthouse Creek and Clark Sound
34	The first Dock in Secessionville Creek at its confluence with Clark Sound
35	Right Fork of Schooner Creek, middle of Docks

(Total 28 Active)

Figure 1.
Shellfish Management
Area 10A
Prior Classification

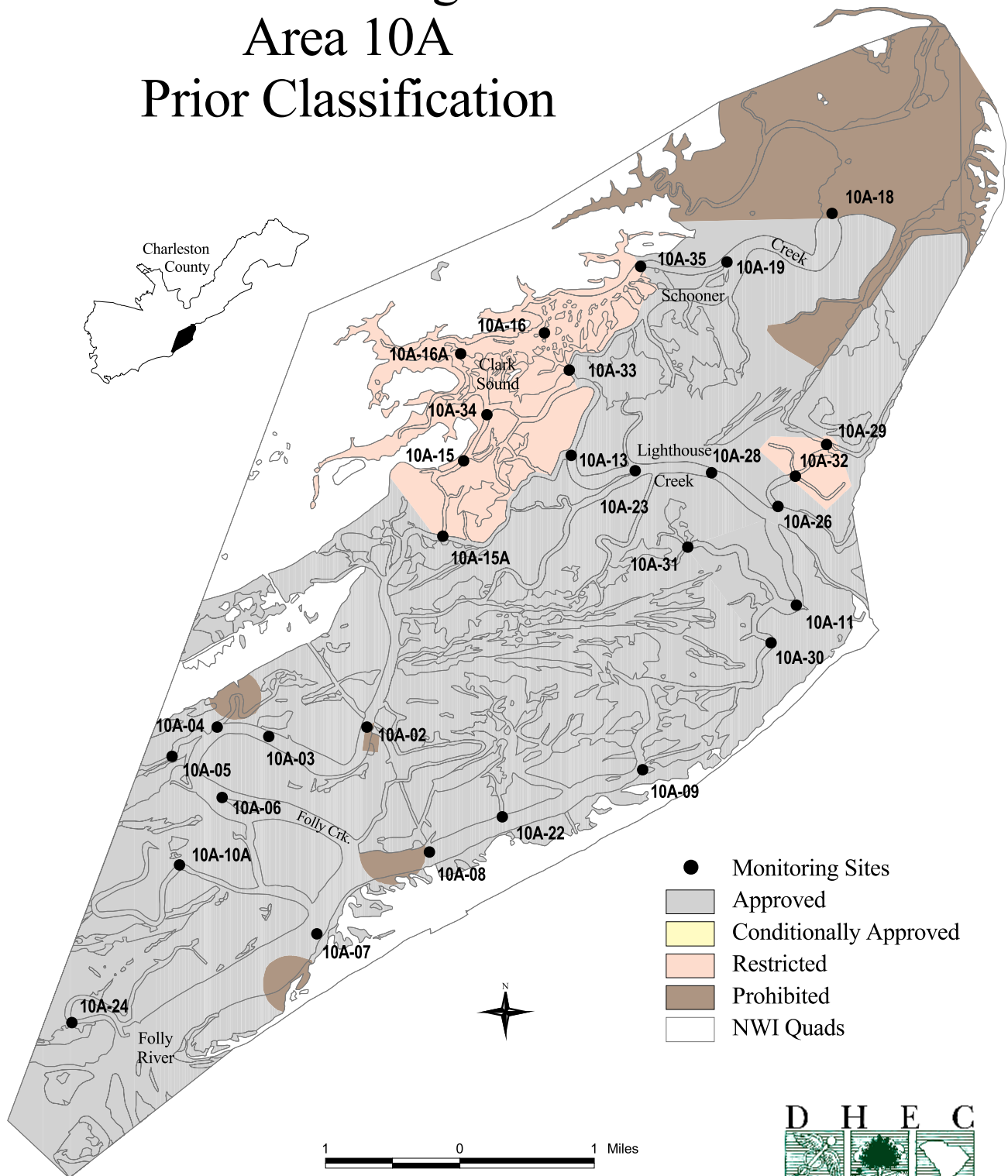


Figure 2.
Shellfish Management
Area 10A
Current Classification

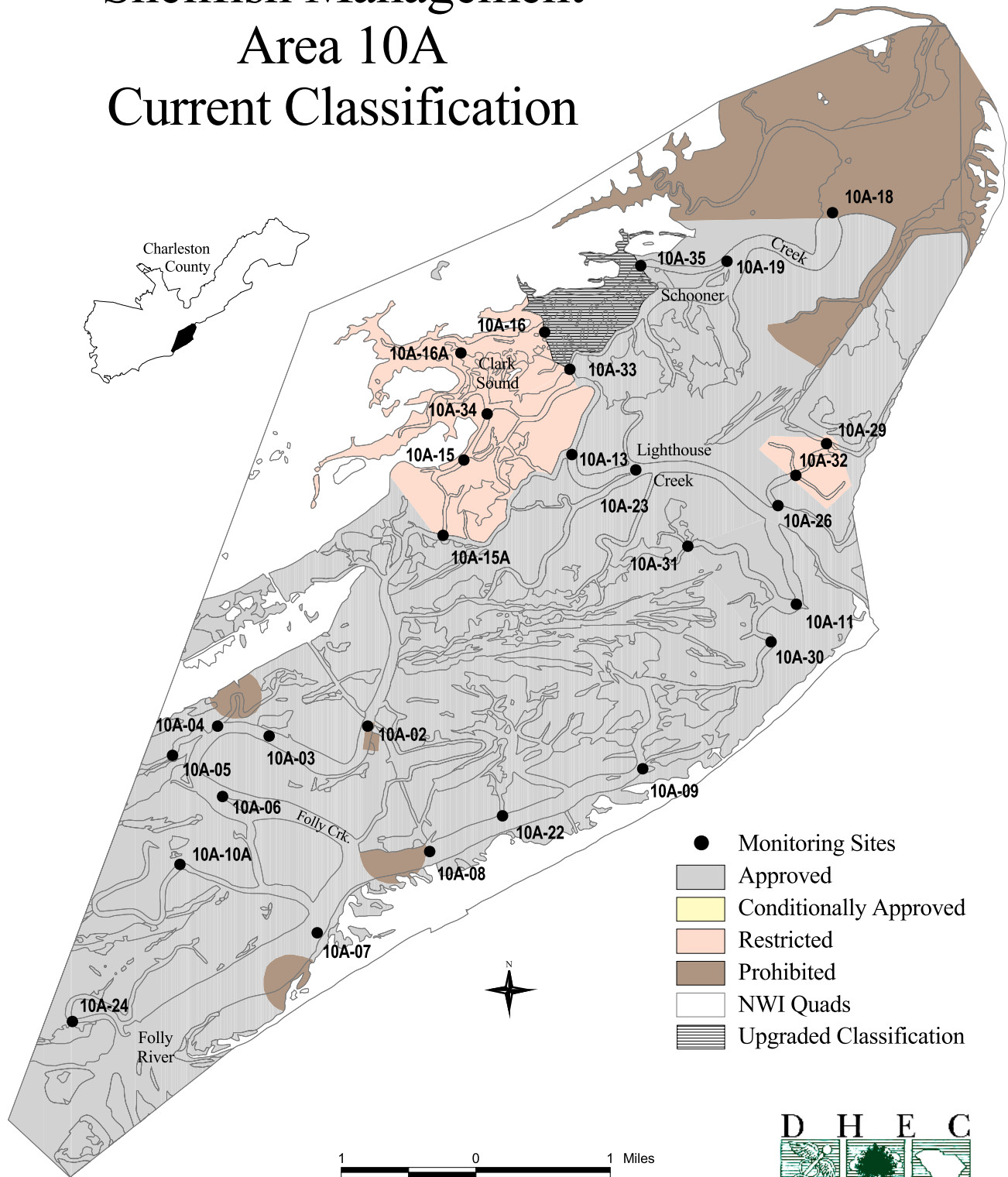


Figure 3.
**Shellfish Management
 Area 10A**
Potential Pollution Sources

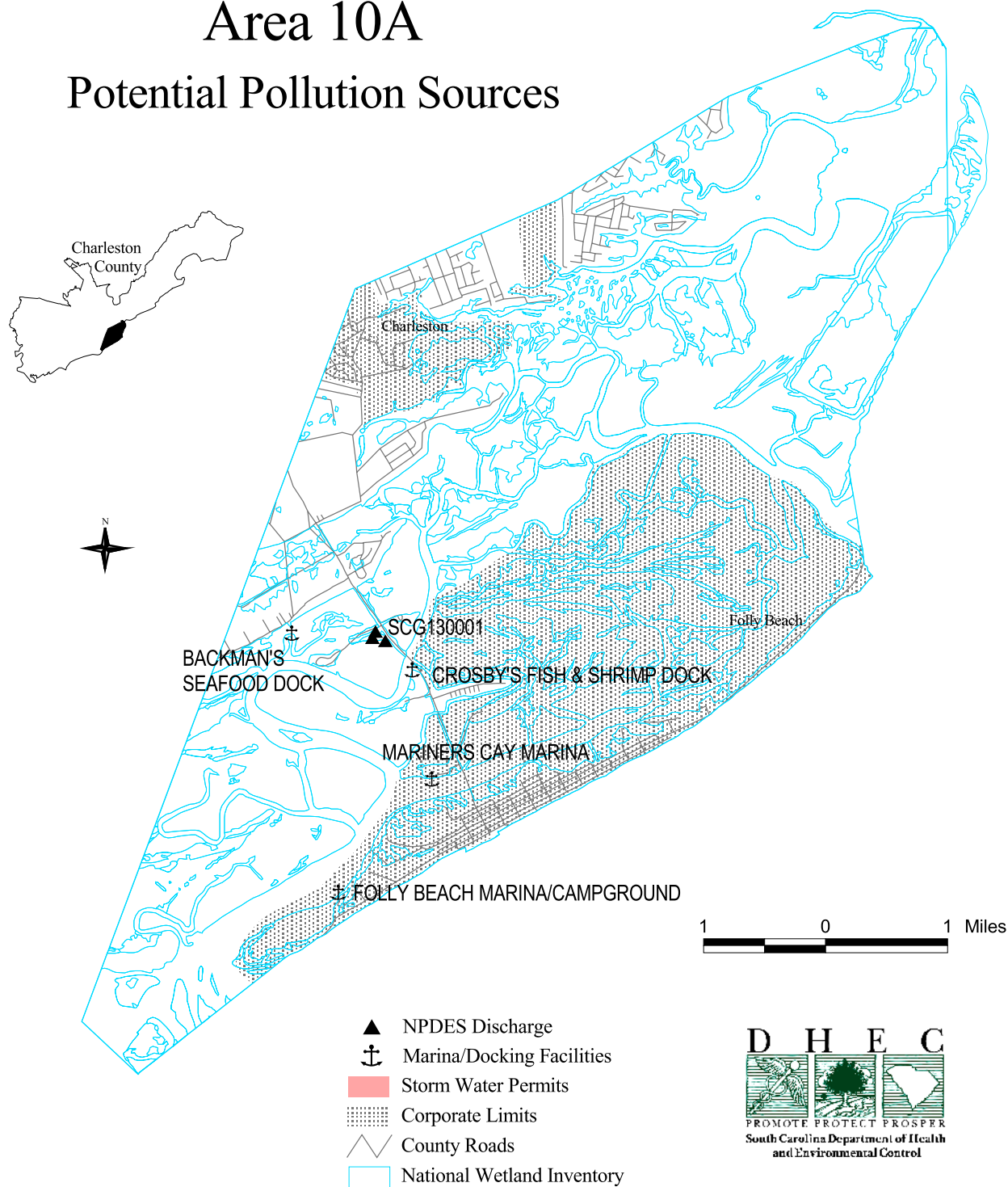


TABLE #2

**Shellfish Management Area 10A
Fecal Coliform Bacteriological Data Summary
From Shellfish Water Quality Sampling Stations**

Between January 1, 2003 and December 31, 2005

Station #	2	3	4	5	6	7	8	9	11	13
SAMPLES	36	36	36	36	36	36	36	36	36	36
GEO MEAN	3.8	2.9	3.9	4.1	3.9	3.8	4.9	6.9	4.7	3.5
90 TH %ILE	11	6	10	12	10	11	14	2.9	15	10
WATER QLTY	A	A	A	A	A	A	A	A	A	A
CLASSIFICATION	A	A	A	A	A	A	A	A	A	R

Station #	15	15A	16	16A	18	19	22	23	24	26
Samples	36	36	36	36	36	36	36	36	36	36
GeoMean	9.3	3.1	8.1	24.4	3.6	5.0	5.6	2.9	2.9	3.0
90th %ile	54	7	35	247	9	16	19	6	7	7
Water Qlty	R	A	A	R	A	A	A	A	A	A
Classification	R	R	R	R	P	A	A	A	A	A

Station #	28	29	30	31	32	33	34	35		
Samples	36	12	36	36	36	36	36	36		
GeoMean	3.0	14.1	4.7	3.4	6.3	3.7	8.4	6.7		
90th %ile	6	86	15	7	25	10	44	39		
Water Qlty	A	R	A	A	A	A	R	A		
Classification	A	R	A	A	R	R	R	A		

A - Approved **CA** - Conditionally Approved **R** - Restricted
RND - Restricted/No Depuration **P** - Prohibited

TABLE #3

**WATER QUALITY
SAMPLING STATIONS DATA**

Shellfish Management Area 10A

Detailed data for each shellfish monitoring station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports, can be obtained by writing South Carolina's Department of Health and Environmental Control – Freedom of Information Office at the address below.

Freedom of Information
SC Dept. of Health & Envir. Control
2600 Bull Street
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

TABLE #4

RAINFALL DATA

Shellfish Management Area 10A

AREA 10A ANNUAL TABLE OF DAILY RAINFALL DATA

*SOURCE: Charleston Commissioner of Public Works
Plum Island Wastewater Treatment Plant (James Island, SC)*

2003	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st			0.55		0.10							
2nd												
3rd			0.10			0.70		0.90			0.30	0.40
4th						0.50		0.60				2.70
5th			0.10						1.50			
6th		0.50	0.60		1.00	0.60		0.10	5.00			
7th			0.60	0.60		0.50			0.30			
8th				2.50		0.20			0.60			
9th		0.10		0.30								
10th		0.20		0.30								0.50
11th												
12th												
13th			0.40			0.10						0.40
14th			0.90				3.50		0.20			0.60
15th			0.10		0.80							
16th		0.55			0.30							
17th			0.70		0.60		0.80			0.10		
18th					1.30	0.80	1.10	0.70				
19th			0.10				0.80				0.20	
20th			1.20									
21st	0.20											
22th	0.45	0.50			1.15				0.10			
23rd	0.10						0.80					
24th												
25th				5.00			0.60					
26th		0.30		0.20			0.40					
27th		0.40			0.60		0.20			0.10		
28th		0.10	0.10			1.30	0.50			2.20	0.30	
29th												
30th			0.20									
31st					0.20							

(Monthly Figures)

Year's Rainfall Total:

55.20

TOTAL	0.75	2.65	5.65	8.90	6.05	4.70	8.70	2.30	7.70	2.40	0.80	4.60
MAX	0.45	0.55	1.20	5.00	1.30	1.30	3.50	0.90	5.00	2.20	0.30	2.70
MIN	0.10	0.10	0.10	0.20	0.10	0.10	0.20	0.10	0.10	0.10	0.20	0.40
AVG	0.25	0.33	0.43	1.48	0.67	0.59	0.97	0.58	1.28	0.80	0.27	0.92

AREA 10A ANNUAL TABLE OF DAILY RAINFALL DATA

*SOURCE: Charleston Commissioner of Public Works
Plum Island Wastewater Treatment Plant (James Island, SC)*

2004	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.00	0.00	0.00	1.10	0.00	0.50	0.10	0.50	0.00	0.00	0.00
2nd	0.00	0.70	0.00	0.00	0.70	0.00	0.00	0.00	0.00	2.50	0.00	0.00
3rd	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.10	0.00	0.20	0.00	0.00
4th	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.20	0.00
5th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6th	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00
7th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8th	0.10	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00
9th	0.60	0.10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00
10th	0.00	0.00	0.00	0.00	0.00	0.00	1.60	0.00	0.00	0.00	0.00	0.00
11th	0.00	0.70	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12th	0.00	1.00	0.00	0.60	0.00	0.00	0.00	3.60	0.00	0.00	0.10	0.00
13th	0.00	0.00	0.00	0.50	0.00	0.00	0.00	1.20	0.65	0.00	0.00	0.00
14th	0.00	0.70	0.00	0.00	0.00	0.00	0.00	1.40	0.00	0.00	0.00	0.00
15th	0.00	0.20	0.20	0.00	0.00	0.30	0.00	1.20	0.00	0.80	0.00	0.00
16th	0.00	0.10	0.20	0.00	0.30	1.10	0.00	0.00	0.00	0.00	0.00	0.00
17th	0.10	0.30	0.00	0.00	0.00	0.40	0.00	0.40	0.00	0.00	0.00	0.00
18th	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.20	0.00	0.80	0.00	0.00
19th	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00
20th	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00
21st	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.20	0.00
22th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70	0.00	0.00	0.00	0.00
23rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00
24th	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00
25th	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	2.00
26th	1.10	0.50	0.00	0.60	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.60
27th	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.10	0.50	0.00	0.90	0.00
28th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	0.00
29th	0.00	0.00	0.00	0.00	0.00	0.00	0.95	3.90	0.00	0.00	0.00	0.00
30th	0.00		0.10	2.40	0.00	0.70	0.00	0.15	0.00	0.00	0.00	0.00
31st	0.00		0.00		0.00		0.20	0.30		0.00		0.00

(Monthly Figures)

Year's Rainfall Total:

56.32

TOTAL	1.90	5.65	0.52	4.70	2.30	3.40	5.55	18.25	5.65	4.40	1.40	2.60
MAX	1.10	1.20	0.20	2.40	1.10	1.10	1.60	3.90	3.00	2.50	0.90	2.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.06	0.19	0.02	0.16	0.07	0.11	0.18	0.59	0.19	0.14	0.05	0.08

AREA 10A ANNUAL TABLE OF DAILY RAINFALL DATA

*SOURCE: Charleston Commissioner of Public Works
Plum Island Wastewater Treatment Plant (James Island, SC)*

2005	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.00	0.00	0.70	0.00	0.10	0.30	0.20	0.00	0.00	0.00	0.00
2nd	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3rd	0.00	0.90	0.00	0.00	0.00	0.40	0.40	0.00	0.00	0.00	0.00	0.00
4th	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00
5th	0.00	0.00	0.00	0.00	1.50	0.60	0.10	0.00	0.00	1.60	0.00	1.00
6th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	1.60	0.00	0.00
7th	0.00	0.00	0.10	0.50	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00
8th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.80
9th	0.00	0.20	0.00	0.00	0.00	0.00	1.00	0.40	0.00	0.00	0.00	0.00
10th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00
11th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00
12th	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.20	0.00	0.10	0.00	0.00
13th	0.20	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14th	0.40	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
15th	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.70	0.00	0.00	0.10	0.30
16th	0.00	0.00	1.20	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17th	0.00	0.00	0.00	0.00	0.50	0.00	0.00	1.50	0.00	0.00	0.00	1.00
18th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00
19th	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00
20th	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	4.00	0.00
21st	0.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70	0.00
22th	0.00	0.00	3.25	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23rd	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.20	0.00	0.00
24th	0.00	0.30	0.00	0.00	0.00	0.00	0.00	2.20	0.00	0.70	0.00	0.00
25th	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00
26th	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00
27th	0.00	2.50	3.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.20	0.00
28th	0.00	0.00	0.40	0.00	0.00	3.50	0.00	0.00	6.10	0.00	0.10	0.00
29th	0.70	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.10	0.00
30th	0.00		0.00	0.00	2.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00
31st	0.00		0.00		1.50		0.50	0.00		0.00		0.00

(Monthly Figures)

Year's Rainfall Total:

64.05

TOTAL	1.40	4.50	8.35	2.00	8.80	9.10	2.30	7.70	6.50	5.00	5.20	3.20
MAX	0.70	2.50	3.25	0.70	3.00	3.50	1.00	2.20	6.10	1.60	4.00	1.00
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.05	0.16	0.27	0.07	0.28	0.30	0.07	0.25	0.22	0.16	0.17	0.10